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ABSTRACT

This paper is intended to serve as an introduction to text analysis as a research tool and vehicle for improving instruction. In terms of perspective, two major theses are maintained throughout the paper: text analysis should be used within the context of understanding that a multiplicity of variables can influence reader/text interactions, and various text analysis models can be used as complements to each other. Six different means of examining text are presented: story grammars, event chain formulations, expository prose predicate structures, mapped patterns, propositional analysis, and cohesion. Each is described briefly and its utility in research and educational practice is explained. The paper concludes with a general discussion of the potential applications of text analysis. (FL)

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DISCOURSE COMPREHENSION AND PRODUCTION: ANALYZING TEXT STRUCTURE AND COHESION

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Discourse Comprehension and Production: Analyzing Text Structure and Cohesion

This paper is intended to serve as an introduction to text analysis as a research tool and vehicle for improving instruction. To this end, seven text analysis models are reviewed together with their pedagogical possibilities. The reviews do not exhaust the text analysis models proposed in the literature or their pedagogical possibilities. In terms of perspective, two major theses are maintained throughout the paper. First, we urge that text analysis be used within the context of understanding that a multiplicity of variables can influence reader-text interactions. Second, we suggest that the various text analysis models can be used as complements, one to another. Distinctions drawn between the various text analysis models should not be used to set the models in competition with one another.

Toward a Text Analysis Perspective

Consistent with contemporary psycholinguistic and cognitive viewpoints is the notion that both the production and comprehension of discourse involve an interaction among reader, text, author and context. This notion suggests that during discourse production the author does not merely transfer words from within his or her brain to a text. Likewise, during discourse comprehension, a reader does not merely transfer words from a text to his or her brain. Rather, as depicted in Figure 1, discourse

comprehension and discourse production involve a complex interaction among (a) the cognitive structures of the author, (b) the text, (c) the cognitive structures of the reader, and (d) the communicative situation.

Insert Figure 1 about here.

Typically, an author goes beyond finding just any set of words to express ideas; an author searches for the words which will create appropriate connotations for the readers of the text. This implies that an author needs to know something about a reader's thoughts including background of experience and interests. It implies that the author has prescribed and can predict the reader's context. It suggests that all these aspects interact back and forth, influencing and being influenced by the production of text. In all, it suggests that what have been labelled text tendencies (i.e., the explicit and implicit ideas, relationships between ideas, structural features, cohesion and stylistic qualities) are constrained by an author's perceptions of an audience, an author's perceived goal for a text, an author's ability to appreciate the effect of a text upon an audience, and the mode and conditions of publication.

During discourse comprehension, the cognitive structures of the reader, the text, and the communicative situation have a similar interactive influence upon a reader's understanding. That is, a reader's knowledge, purpose, interest, attention, and focus influence and are influenced by discourse comprehension. Likewise, the communicative situation, including

the physical and sociocultural conditions of the reading situation, constrain comprehension strategies and outcomes. Thus, discourse comprehension can be viewed as involving the construction of meaning wherein the following conditions apply: (a) a reader initiates, directs and terminates any interaction with a text; (b) a text is never fully explicit nor is comprehension of a text exclusively textual; (c) a reader inserts, substitutes, deletes and focuses ideas toward refining an interpretation which seems plausible, connected and complete; (d) a number of factors contribute to the extent to which a reader's understanding will vary from the author's intended message. To reiterate a major thesis, discourse comprehension evolves from a myriad of complex interacting influences.

Procedural Models for Text Analysis

In recent years, the fields of linguistics, cognitive psychology and computer science have afforded a number of systems for examining the contribution of text features to discourse comprehension. In this regard, the work of Dawes (1966), Frederiksen (1975), Grimes (1972), Halliday and Hasan (1976), Kintsch (1974), Meyer (1975a, 1975b), and Rumelhart (1975) have been seminal. These systems which might be labelled procedural models for text analysis, can be broadly defined as systems for examining the characteristics of text and knowledge of text from a semantic perspective. An implicit tenet of most of these systems is the notion that a text is the reflection of the writer who produced the text and that some specificity

relative to discourse production and discourse comprehension can be derived by analyzing and comparing a subject's knowledge to the characteristics of the text itself.

The uses of text analysis for the researcher and theorist seem obvious. Text analysis provides the means for a systematic examination of the effects of selected text characteristics upon reading comprehension. Indeed, over the past decade, numerous valuable insights relative to discourse comprehension have been derived from research based upon text analysis models. For example, text analysis research has suggested that certain aspects of text structure do influence the amount and type of information recalled and that tenable predictions can be made as to where distortions, omissions, additions, substitutions and restructuring will occur. Chodos and Mosenthal (Note 1), Kintsch (1974), Mandler and Johnson (1977), Rumelhart (1975), Stein and Glenn (1978) and Thorndyke (1977) have shown the influence upon reading comprehension of a generalized story structure which most readers possess. McKoon (1977), Meyer and McConkie (1973) and Meyer (1975a, 1977) have shown the influence of the hierarchical structure of expository prose and the importance of the position of ideas within text structure. Clements (1975) demonstrated the influence of the staging of ideas. Marshall (1976) and Tierney, Bridge and Cera (1979) have demonstrated the influence of propositional content and interpropositional relationships.

From a practical perspective, educators interested in applying text analysis findings and technology need to be aware of what text analysis can and cannot do. In general, it is our argument that text analysis has

the potential to be used and misused. Within the context of an appreciation of reader-text interactions, analyses of text features seem both warranted and appealing. Outside this context, such analyses and their derivatives may be misguided.

The next section is intended to familiarize the reader with what text analysis can and cannot do. In this section, six different means of examining text are presented: story grammars, event chain formulations, expository prose predicate structures, mapped patterns, propositional analysis, and cohesion. Our discussion includes a brief overview of each text analysis system and some commentary relative to its utility in research and educational practice. This section is then followed by a general discussion of what seems to be the potential application of text analysis.

Propositional Analyses

Based upon Fillmore's (1968) case grammar, the primary concern of many recent discourse models has been on semantics with an emphasis upon propositions and propositional structures. For example, models by Kintsch (1974) and Frederiksen (1975) are among the popular models concerned with propositional analysis. Basic assumptions of these models have been that a sentence is comprised of one or more propositions reflecting the knowledge of the speaker or writer, and that the pivot of each proposition is the verb.

Kintsch's propositional text base. As Turner and Green (1977) state, the use of prose texts in research requires a system for formally representing

the meaning of texts. Kintsch's propositional system (see Kintsch, 1974) addresses that requirement. Basic terms of Kintsch's system are the proposition, or idea unit, and the text base, or the list of connected propositions constituting a text.

Kintsch (1974) refers to the set of propositions for a text as its microstructure or text base. Three types of text base are distinguished: the text base structure, the template text base and the protocol text base. The text base structure is equivalent to the knowledge base of the author who generated the text and can only be inferred. The template text base represents a model of the text, and it comprises a list of connected propositions which can be arranged into a hierarchical network. The protocol text base represents the stated recall of a reader for a text and is scored by comparing it to the template text base.

The construction of a template text base and a protocol text base requires reducing the text to an ordered list of propositions or idea units, each unit composed of relations and arguments. Arguments are the concepts represented by one or more words in the text. Relations are the pivotal concept in the proposition and connect the arguments so that together, arguments and relations represent single ideas.

As an example, consider a template text base for the opening sentences of "An Occurrence at Owl Creek Bridge," by Ambrose Bierce (1978).

Text: A man stood upon a railroad bridge in Northern Alabama, looking down into the swift water 20 feet below. The

man's hands were behind his back, the wrists bound with a cord. A rope loosely encircled his neck.

Template Text Base:

1. (QUALITY OF, BRIDGE, RAILROAD)
2. (STAND, MAN, 1)
3. (LOCATION: IN, 2, NORTHERN ALABAMA)
4. (QUALIFY, BELOW, 20 FEET)
5. (QUALITY OF, WATER, SWIFT)
6. (LOCATION: 4, 5, $)
7. (LOOK DOWN, 3, 6)
8. (PART OF, 7, HANDS)
9. (PART OF, 7, BACK)
10. (LOCATION: BEHIND, 8, 9)
11. (BIND, $, WRISTS, CORD)
12. (PART OF, 7, NECK)
13. (ENCIRCLE, $, 12, ROPE)
14. (QUALIFY, 13, LOOSELY)

Each line represents a proposition. The relation is written first in the proposition, followed by its arguments. Consider the three propositions which make up the clause, "A man stood upon a railroad bridge in Northern Alabama." In Proposition 1, the relation dominating the proposition is QUALITY OF. The arguments are BRIDGE and RAILROAD. The relation QUALITY OF signifies a modifying proposition. In the second proposition, STAND is the relation, and MAN and RAILROAD BRIDGE are the arguments. Notice that instead of writing RAILROAD BRIDGE, the number of the proposition denoting "railroad bridge" is substituted. STAND signifies a predicate proposition. Predicate propositions represent actions or states. In Proposition 3, the relation is LOCATION and is specified by IN. Proposition 2 and NORTHERN ALABAMA are the arguments. LOCATION signifies a connective

proposition. Connective propositions relate whole propositions or facts with other propositions or facts.

The relations QUALITY OF, STAND, LOCATION are representative of the three classes of propositions which define all propositions. The three classes are predication, modification, and connection. The classification of propositions is based on the way a relation binds its arguments. While the relation and its arguments may be depicted by words in the text, they represent abstract word concepts which are not to be confused with the words explicitly stated in the text. For purposes of preparing a text base, the relation and its arguments are represented by capitalized words to indicate they are word concepts. Note also, in the example of STAND, that tense is not represented in proposition. Turner and Green explain that tense is a product of syntax and is therefore not included in a semantic representation of text. A discussion of the classes of propositions follows.

As stated, predicate propositions represent actions or states. Usually, these relations are verbs. Their arguments fill certain slots defined in relation to the verb dominating the proposition. For example, in Proposition 11, the verb BIND has a slot for the "one who binds," called the AGENT. In the text under consideration, the AGENT is not specified and the symbol $ is substituted. BIND also has a slot for the person or thing "bound" called the OBJECT. This slot is filled by WRISTS. Finally, BIND has a slot for the instrument used for "binding" called the INSTRUMENT. This slot is filled by CORD. With this additional notation, Proposition 11 could be written (BIND, A$, O:WRISTS, 1:CORD). It is a matter of preference whether

the slots are designated in the proposition. In the "Occurrence" text, STAND (Proposition 2), LOOK DOWN (Proposition 7), BIND (Proposition 11), and ENCIRCLE (Proposition 13) are predicate propositions.

Modifier propositions qualify arguments of a proposition or a whole proposition. Propositions 1, 4, 5, 8, 9, 12 and 14 are examples of modifying propositions. There are four types of modifying propositions: Qualifiers, Partitives, Quantifiers, and Negations. QUALITY OF and QUALIFY are qualifiers with adjectival and adverbial functions, respectively. PART OF is a partitive type of modifier proposition whose function is to define the relationship of a part to a whole (see Propositions 8, 9, 13). Besides qualifiers and partitives there are quantifier and negating types of modifier propositions. Quantifiers are usually signalled by the relation NUMBER OF. Negations are signalled by the relation NEGATE.

Connective propositions serve a special function in that they are the only means of coordinating propositions representing separate sentences. There are eight major classes of connectives with each class having many examples. In a connective proposition the class of the connective is given followed by the word concept which is the example of the class, as in (CONJUNCTION: AND . . .). The arguments of the proposition follow AND. The remaining classes follow with an example of the class: (DISJUNCTION: OR . . .), (CAUSALITY: CAUSE . . .), (PURPOSE: IN ORDER TO . . .), (CONCESSION: ALTHOUGH . . .), (CONTRAST: BUT . . .), and (CONDITICN: IF . . .). The final class is CIRCUMSTANCE and has three sub-classes TIME, LOCATION, and MANNER. In the "Occurrence" text, the only connective propositions are CIRCUMSTANCE propositions denoting

LOCATION. They are characterized by the word concepts IN (Proposition 3), 20 FEET BELOW (Proposition 6), and BEHIND (Proposition 10).

It must be remembered that Kintsch's reason for creating a text base is to provide a legitimate breakdown of ideas in text against which recalls, broken down into protocol text bases, may be compared. It is as if Kintsch has provided a means for comparing "deep structures" of text and recall. As a research tool, Kintsch's system is quite powerful.

But the propositional text base is not only understood as a tool. Kintsch means his propositional analysis to provide a means of describing, experimentally, the mental processes involved in comprehension of text (see Kintsch & van Dijk, 1978). The first part of the comprehension process organizes the "meaning elements of a text" into a coherent microstructure. The ideal microstructure is approximated by the template text base, while the actual microstructure generated by the reader is approximated by the protocol text base. The second aspect of the comprehension process is the generation of a macrostructure from the microstructure. This aspect represents a condensing of information into a manageable unit for memory--Kintsch calls it the "gist" of the text. It is important to understand the relationship of the two aspects of the comprehension process to the structural representation of text. On the one hand, the structural theory underlying the construction of a template text base and protocol text base is, as Kintsch describes it, "a semi-formal statement of certain linguistic intuitions" (Kintsch, & van Dijk, 1978, p. 365). The comprehension model, on the other hand, means to predict the protocol text base. The comprehension model is applied to the template text base and generates an

expected protocol text base. The experimental success of such an endeavor is dependent on a system that will generate macropropositions as legitimately as the micropropositions of a text base are generated. However, the generation of macropropositions and an overall macrostructure of text is a process that is not as mechanically sound as the rules for generating the microstructure and will not be discussed at this time.

The strength of Kintsch's system lies in its simplicity and in its ability to represent well "linguistic intuitions" about the surface structure of text. Also, the system is not confined to a text type as are story grammars and Meyer's system for describing expository text structure. Rather, Kintsch's system is flexible enough to deal with any text type. With that flexibility, Kintsch's system represents a powerful tool for research in reading comprehension. It must be pointed out that Kintsch's system is not a tool for testing or teaching but is rather a tool for research that complements a theory of discourse comprehension.

Frederiksen's semantic and logical networks. Based upon the premise that an examination of comprehension must account for the interplay between text-based and knowledge-based processes, Frederiksen's model offers a text analysis framework which purports to address the text, reader and communicative context, and which is based upon the semantic content and logical structure of the text. In brief, the semantic content consists of propositions that are represented as networks of concepts connected by labelled binary relations. The concepts and connectors parallel the arguments and relations represented in a Kintsch analysis. The logical structure represents the logical, causal and algebraic relations between propositions (Frederiksen,

1975, 1977, Note 2; Frederiksen, Frederiksen, Humphrey & Otteson, Note 3). In a Kintsch analysis these would be represented by connectives relating distinct propositions.

For an illustration of the use of Frederiksen's framework, consider a reader's recall of selected sentences (see Table 1). The sentences were

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Insert Table 1 about here.

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taken from a story; the reader's recall was taken from a recall for the entire story. At the lowest level, Frederiksen's framework would define the semantic content and logical structure of the text. At subsequent levels of analysis, Frederiksen's framework affords a concurrent text-based analysis of inferences and a functional examination of their role. For example, in Table 1, the semantic content and logical structure of a text is represented by numbered propositions. The abbreviated symbols denote some of the concepts and relationships defined by Frederiksen's semantic and logical network system. Tables 2 and 3 provide a modified version of Frederiksen's Taxonomy of Text-Based Inferences and his list of Functional Contexts.

Insert Tables 2 and 3 about here.

In undertaking a Frederiksen analysis the following guidelines for analyzing a text and scoring recalls are used.

Analyzing a text. The first step is to define the text in terms of its semantic content and logical structure. This requires breaking the text

down into propositions or idea units and defining the concepts and relationships represented within and between propositions.

Within propositions, the semantic network specifies relations and two types of concepts--objects and actions. Objects are defined as things occupying space. Actions are defined as things which occupy an interval of time and which involve change. There are two major sub-classes of actions--resultive and processive. Resultive actions involve a physical or cognitive change; processive actions involve no change in state.

Represented within the semantic network are three types of relations--stative, manner and case. Stative relations are relations which distinguish an object from other objects. They include determination, quantification, identification, classification, attribution, locative, temporal, and part-whole. The major relationships represented within any text are the case relationships. Case relationships specify the relationship of an action and fit into different frameworks depending upon whether they represent processive or resultive actions. Processive actions have the following case framework:

(object)	-	(processive action)	-	(object) (theme) (goal)

Resultive actions have the following case framework:

(object)	-	(resultive action)	-	(object) (source) (result) (instrument) (goal)

All case relationships are further specified by tense, qualifier and aspect relations. To illustrate, consider the following representation of the

sentence John can swim well. This sentence represents a processive action involving the present tense and a qualifier. Also embedded within the proposition is a relationship involving manner. Using Frederiksen's system, the sentence would be represented as follows:

(John) - Pat @ Ten (Pres) @ Qual (can) - (swim) - Man - (well)

Alternatively, consider the representation of a sentence involving a resultive action: John ran down the road. This sentence would be represented as follows:

1.0 (John) - Agt @ Ten (Past) - (ran) - Result - (1.1)
1.1 (John) - Loc - (road, down)

It should be noted that case relations represent the major relations evident in a text and that not all slots are filled within the case framework. Some slots are mandatory; other slots are optional. Also, it should be noted that selected slots require a proposition which is embedded. As illustrated in the last example, the embedded stative proposition detailing location was given the same number as the major proposition, but a decimal was added to tag it as embedded.

In addition to the semantic network, Frederiksen proposes a logical network in order to specify relationships across propositions. That is, the logical network represents the causal, logical and algebraic relations which connect propositions temporally, causally, comparatively, conjunctively, and concessionally. For example, suppose a sentence within a text defined an explicit relationship between two propositions. Consider the sentence,

The dinosaurs died because they could not find food. In all, three propositions would be needed to represent this sentence. Two would represent case relationships; one would specify the causal relationship between the other two propositions.

1. (dinosaurs) - Pat @ Ten (Past) @ Qual (can) @ (neg) - (find) - obj (food)
2. (dinosaurs) - Pat @ Ten (Past) - (die)
3. (1) - cau (2)

As the example illustrates, Proposition 3 specifies the causal relationship and, therefore, represents the logical network.

Thus, the semantic and logical networks together define the content and structure of a text. In so doing, these networks purport to provide a representation of the writer's knowledge structure which is referred to as the message base of a passage. This message base serves to define the characteristics of a particular text and can serve as a template for studying discourse processing including inferential operations. In all, it represents the first level of analysis using Frederiksen's system.

Scoring recalls. Scoring recalls represents the second and third levels of analysis. Specifically, scoring recalls entails preparing a semantic and logical network of each subject's recall and comparing each to the message base of the original passage. This involves marking every item in the subjects recall that corresponds to the message base as defined for the original text. When all of the explicitly stated items have been marked, each proposition in the recall is analyzed to determine the types of

inferences represented by the information generated by the reader. In accordance with Frederiksen's taxonomy of inferences, this entails a concurrent examination of inference type, inferential operations and inferential functions. For example, suppose a reader generated a causal relationship between two previously disconnected propositions. According to Frederiksen's second and third level of analysis, this inference would be classified as a dependency operation involving a causal inference toward connecting disconnected propositions.

Of the various text-analysis frameworks presented, Frederiksen's system of analysis appears to be the most comprehensive. Indeed, some might argue that Frederiksen's methodology is too detailed and, therefore, too time-consuming and difficult to manage. In terms of propositional analysis, Frederiksen's system has some advantages over other microanalyses such as that proposed by Kintsch. Unlike Kintsch, Frederiksen leaves unfilled any slot which is not explicitly cued by the text. Rather than fill slots likely to be inferred, Frederiksen offers a taxonomy of inferences. Thus, if Frederiksen's model of text analysis and taxonomy of inferences are used concurrently, Frederiksen's system would offer a more systematic and objective procedure for examining a reader's text-based recall.

From a theoretical perspective and as a research tool, Frederiksen's analysis represents a valiant attempt to address the issue of text-based inferences and to synthesize the work being done both in linguistics and in psychology. Unfortunately, in attempting to determine the underlying

representation of a text, Frederiksen's system, along with Kintsch's system, is often limited by the inability of the researcher and even the writer to recognize underlying message bases represented within the text. Also, it offers no guidelines for addressing either implied meanings or indirect speech acts involved in conversations.

With the evolution of Frederiksen's system, however, versions of his text analysis procedures have been used successfully to glean important information concerning the influence of the semantic content and logical structure upon reading comprehension (Marshall, 1976; Bridge, 1977; Tierney, Bridge & Cera, 1979; Pearson, Note 4). The major advantage of Frederiksen's system, however, is the flexibility it affords. Analysis can be done at various levels and the system can be applied to almost any text. A limitation is that Frederiksen's system does not consider implied meanings or structural qualities beyond the interpropositional level, and his categories for inferences seem to overlap. Obviously, unless it were used in a very general way, Frederiksen's text analysis model would be well-nigh impossible for teachers to use.

Cohesion

Unlike structural explanations of content, cohesive analyses describe the patterns in the fabric or texture of a text. In accordance with this conceptualization, text is viewed as "language in use" and as "language . . . relevant to its environment" (Halliday, 1977). This contrasts with "language in the abstract" and "decontextualized language like words in a

dictionary or sentences in a grammar book" (Halliday, 1977). As viewed by Halliday and Hasan (1976), a text is a semantic unit of any length and function--so long as it does function (as a sign, a recipe, a book, etc.). The text is the basic unit of the semantic system. It is a unit defined by its functional relevance.

According to Halliday and Hasan (1976), cohesion is displayed in the ties that exist within text between a presupposed item and a presupposing item. For example, in the sentences "John makes good meals. Last night, he made spaghetti," "he" is the presupposing item and "John" is the presupposed item. Text derives texture from the fact that it functions as a unity with respect to its environment and the fact that this unity can be described by the ties that exist between presupposing and presupposed items. It is these cohesive ties within a text that establish a text's continuity. That is, cohesive ties represent a kind of linguistic mortar which connects the text together. As Halliday and Hasan suggest:

> The concept of ties makes it possible to analyze a text in terms of its cohesive properties and give a systematic account of its patterns of texture. (p. 4)

Halliday and Hasan detail various types of cohesive ties evident in texts: reference, substitution/ellipsis, lexical cohesion and conjunction. Each type reveals presupposed and presupposing items. The connection of such items across sentences defines the semantic continuity, texture or cohesiveness of a text.

Reference. Reference in extended text typically includes what Halliday and Hasan label personals, demonstratives, and comparatives. The personals

include the personal pronouns and their possessive forms: he, him, his, they, them, theirs, their, it, its, etc. The demonstratives include: this, these, that, those, here, there, then and the. The comparatives typically are adjectives or adverbs presupposing an item already mentioned. same, equal, better, more, identically, so, etc. Generally, an instance of referential cohesion occurs when an item in a text can only be interpreted by reference to a preceding item in the text. Consider the following examples of personal, demonstrative, and comparative reference:

a. personal:
   The three young businessmen had lunch together.
   They ended up drinking much too much.
   (they refers to the three young businessmen)

b. demonstrative:
   Dr. Forbes drove eight miles in a blinding snowstorm to get to Plainfield to see the Gardner boy. Two days later he had to drive there again.
   (there refers to Plainfield)

c. comparative:
   John sold him three tires for the price of one.
   Jack asked, "Why didn't you give me the same deal?"
   (same refers to three tires for the price of one)

When dealing with reference in written text, the assumption is made that the referential ties are endophoric or text-determined (within the text) as opposed to exophoric or situationally-determined (outside the text). For example, if an adolescent was overheard to say "that's bad," we would not know what he was referring to unless we saw the custom-made van he was

looking at. This is an example of exophoric reference--it is reference dependent upon the actual situation. If a similar situation were part of a novel, that would refer endophorically to the words custom-made van, or the description of the van given in the text.

It is also assumed that endophoric reference is either anaphoric (presupposing an item that appears in preceding text) or cataphoric (presupposing an item that appears in subsequent text). However, cataphoric reference occurs primarily within a sentence and so can be explained by the structure of the sentence. Consider the following example of cataphoric reference:

The player who slacks off in practice won't play in the game.

The player refers forward to who slacks off in practice.

Rarely are there instances of cataphoric reference in text which extend across sentences. However, cataphoric reference can occur across sentences and is to be considered genuinely cohesive in those cases:

He actually did it. He asked her out.

(the second sentence is cohesive with it)

Thus, we are left with a description of referential cohesion within the written text that assumes the cohesive tie to be predominantly endophoric and anaphoric.

Substitution and ellipsis. Substitution and ellipsis are distinguished in the following way: Substitution replaces one item with another, and ellipsis omits an item that is assumed. An example of substitution is:

My razor is dull. I need a new one.

(one substitutes for razor)

An example of ellipsis is:

I can only remember the names of 48 states. I need to name two more.
(two more states is understood)

Three categories of substitution and ellipsis are described by Halliday and Hasan. They are nominal substitution/ellipsis, verbal substitution/ellipsis, and clausal substitution/ellipsis. In substitution the word(s) appearing in text can refer back to a noun phrase, a verb phrase or a clause. In ellipsis the word(s) omitted can be a noun phrase, a verb phrase or a clause.

In substitution the three categories are defined by the use of explicit word substitutions:

Nominal: one, ones, same

Look at these pictures from the scrapbook.
That one is the oldest.
(one substitutes for picture)

These books are no good. Get me some better ones.
(ones substitutes for books)

John is an excellent cook. The same can't be said of his wife.
(the same substitutes for is an excellent cook)

Verbal: do

Why are you fidgeting? I didn't know I was doing so.
(doing so substitutes for fidgeting)

Clausal: so, not

Are gas prices going up? The paper says so.
(so substitutes for gas prices are going up)

Are gas prices going up? I hope not.
(not substitutes for gas prices are not going up)

At one point, ellipsis is described as substitution by zero. But the mechanics of substitution and elliptical cohesion are complex enough that Halliday and Hasan preserve the two separate identities. Generally, ellipsis can be defined as the omission of an item that is understood or assumed. For example:

Nominal ellipsis

Which game do you want to go to?
The first.
(game is understood in the response)

Verbal ellipsis

Has he tasted John's cooking?
He may have.
(tasted John's cooking is understood in the response)

Clausal ellipsis

Jack was going to get some beehives.
Who was?
(going to get some beehives is understood in the response)

Up to this point substitution and ellipsis have been understood as the replacement of a word(s) by another word(s) and the omission of a word(s) whose presence is understood. There is more to it. The nature of the relationship between presupposed and presupposing items in reference and

substitution/ellipsis is essentially different. A reference tie describes identity; substitution/ellipsis describes contrast. Consider the sentence:

These books are no good. Get me some better ones.

Ones substitutes for books. Yet, the substitution is not an identity of reference. Rather, the message of the response is contrastive. Halliday and Hasan say that the substitute repudiates the preceding message. Ones actually refers to the non-identified books which are better. Ones does refer to the word-concept book, but only as a means of contrasting better with these.

Conjunction. Conjunction is described as an instance of semantic connection. Typical connectives such as and, but, so, next, etc. can identify conjunctive cohesion. For example:

He is cheap sometimes. But he can be generous when he wants to.

They'll be back at 10. So come over early.

Conjunctive items within a sentence, as with other cohesive items within the sentence, can be described structurally. But in connecting separate sentences, the conjunctive item receives a cohesive emphasis that characterizes the relationship between the two sentences. As Halliday and Hasan state,

> conjunctive elements are cohesive not in themselves but indirectly, by virtue of their specific meanings. They are not primarily devices for reaching out into the preceding . . . text, but they express certain meanings which presuppose the presence of other components in the discourse. (1976, p. 226)

Halliday and Hasan describe four types of conjunctive relations. They are additive, adversative, causal, and temporal. There is a great wealth

of possible conjunctive words and phrases which communicate many shades of meaning. These shades of meaning are indicated by the following examples: conjunctive relations of the additive type are characterized by such connectives as and, nor, furthermore, by the way, thus, in the same way. Examples of adversative connectives are yet, but, however, in fact, on the other hand, rather, in any case. Some causal connectives are so, because, it follows. Finally, examples of temporal connectives are finally, then, meanwhile, to sum up.

Lexical cohesion. Lexical cohesion is broken into two parts, reiteration and collocation. Reiteration, as with reference, establishes a relationship of identity:

> Dick and I did the climb to Window Rock. The climb was easy. (climb in the second sentence reiterates climb in the original statement)

However, in lexical reiteration the presupposing item is presupposing because it is reiterative.

There is another difference between lexical reiteration and reference. In being reiterative, a word need not be identical to the presupposed item. Consider the following example:

a. We parked the car and started the climb to Window Rock.

The presupposed item is climb in (a). In (b) the same item is repeated, in (c) a synonym is substituted, in (d) a superordinate word-concept is substituted, and in (e) a general noun is substituted. These four categories represent variations in the system of reiteration.

Reiteration has qualities similar to substitution. Though not precisely contrastive, the meaning of a presupposing item in an example of reiteration need not make explicit reference back to a presupposed item. Consider the following example:

a. That siamese cat is beautiful.
b. That cat has won many awards.
c. There's another Siamese cat entered in this competition.
d. Both cats are beautiful.
e. Most Siamese cats are beautiful.

In (b) the reference is identical between cat and cat in (a). In (c) another Siamese cat excludes the cat in (a). In (d) both cats includes cat in (a). In (e) cats is unrelated referentially to cat in (a). These four different relationships to the presupposed item are labelled identical, exclusive, inclusive, and unrelated. These relationships are determined by text usage whereas the same word, synonym, superordinate, general word types mentioned above are descriptive of the system of reiteration, independent of usage in text.

Lexical collocation can be simply described as "the association of lexical items that regularly co-occur" across expanses of sentences if need be (Halliday & Hasan, 1976, p. 285). Consider the similar lexical

environment shared by such words as wool, ewe, sheep and lamb. In a text, this sequence of words is referred to as a cohesive chain. Meaning is generated by the associations the reader makes between the ideas represented by the words. Such meaning is a kind of synthesis of the elements in a shared lexical environment. Consider the following cohesive chain: newstand, Sunday newspaper, funnies, read, papers, Sunday crossword puzzle, etc. If a writer were describing a Sunday morning sequence of a day in the life of a city dweller, the above chain and the shared lexical environment it defines might be expanded to include such words as deli, and bagel, and perhaps even happy. The writer might join the Sunday morning sequence with a Saturday night sequence tying movie, bar, friends, etc., to the Sunday morning vocabulary. The obvious expanding associative potential of collocational items emphasizes the semantic power of a shared lexical environment independent of text structure.

The study of the concept of cohesion represents a necessary counterpoint to the study of structure and content in prose. Early in this section, cohesion was referred to as the mortar of an interpretable text. Cohesive language, the bulk of any text, not only makes the text interpretable in its function as mortar, it play a major role in determining the text's characteristic "feel," its affective power.

Two examples follow which point out the mortar-like quality of cohesion and its affective power. The first example takes an excerpt from John Osborne's Look Back in Anger (New York: Bantam, 1977, Act II, Scene 1). A

fairly complete table of the cohesive items in the passage is given. The table is a simplified version of the tabular form Halliday and Hasan use to chart the cohesive items in the passages they analyze. Sentences or phrases that are equivalent in meaning or that are specific statements of a previous general statement are included as examples of lexical collocation. Arrows within the PRESUPPOSED ITEM column indicate a series of items cohesive one with another. The first item is the item immediately presupposed; the second item in the series is more distant in the text from the presupposing item, etc. The arrows are supplied as a means of showing the mortar-like quality of cohesive ties. The text and its cohesive analysis follow:

Alison: 1 Did you manage all right?

Helena: 2 Of course. 3 I've prepared most of the meals in the last week, you know.

Alison: 4 Yes, you have. 5 It's been wonderful having someone to help. 6 Another woman I mean.

Helena: 7 I'm enjoying it. 8 Although I don't think I shall ever get used to having to go down to the bathroom every time I want some water for something.

Alison: 9 It is rather primitive, isn't it?

Helena: 10 Yes. 11 It is rather.

Sentence Number	Cohesive Item	Type	Presupposed Item
1	you	Reference	Helena (sentence 1 refers exophorically to situation)
2	of course	Ellipsis	of course I managed all right.
3	(have) prepared (most of the meals in the last week)	Lexical Collocation	managed (all right)
4	you have	Ellipsis	you have prepared most of the meals in the last week ⟶ managed all right
5	someone help	Lexical Reiteration Lexical Collocation	Helena sentence 4 ⟶ sentence 3
6	another woman	Reference Lexical Reiteration	someone someone ⟶ Helena
7	it	Reference	help(ing) ⟶ sentence 4 ⟶ sentence 3
8	although sentence 8	Conjunction Lexical Collocation	sentence 7 and sentence 8 it ⟶ help(ing) sentence 4 ⟶ sentence 3
9	it	Reference	having to go down to the bathroom every time I want some water for something
11	it rather	Reference Lexical reiteration, Ellipsis	it ⟶ having to go . . . rather ( ) rather primitive (E)

The second example is given to show the affective, associative power of collocational items. The shared lexical environment, used or created by the writer in his choice of words, helps determine the perspective and the character of the text as a whole. The opening paragraph of Tom Wolfe's Electric Kool-Aid Acid Test (1977) demonstrates this point. Only the collocational items of the paragraph are discussed.

> That's good thinking there, Cool Breeze. Cool Breeze is a kid with 3 or 4 days' beard sitting next to me on the cramped metal bottom of the open back part of the pickup truck. Bouncing along. Dipping and rising and rolling on these rotten springs like a boat. Out the back of the truck the city of San Francisco is bouncing down the hill, all those endless staggers of bay windows, slums with a view, bouncing and streaming down the hill. One after another, electric signs with neon martini glasses lit up on them, the San Francisco symbol of "bar"--thousands of neon-magenta martini glasses bouncing and streaming down the hill, and beneath them thousands of people wheeling around to look at this freaking crazed truck we're in, their white faces erupting from their lapels like marshmallows--streaming and bouncing down the hill--and God knows they've got plenty to look at. (p. 1)

In the discussion below, phrases, not just individual words, are identified as collocational. Also, as noticed in the long middle sentence, collocational items need not be restricted by sentence structure and sentence boundaries. There are several cohesive chains (chains of words sharing the same lexical environment) found in this paragraph. Consider the following chains:

a. cramped metal bottom . . . open back part . . . pick up truck . . . rotten springs . . . boat . . . back of the truck . . . freaking crazed truck

b. sitting . . . bouncing along . . . dipping . . . rising . . . rolling . . . bouncing down the hill . . . bouncing . . . streaming down the hill . . . streaming and bouncing down the hill

c. endless . . . one after another . . . thousands . . . hundreds . . . thousands

d. city of San Francisco . . . staggers of bay windows . . . slums with a view . . . San Francisco

e. electric sign . . . neon martini glasses . . . symbol . . . bar . . . neon-magenta martini glasses . . .

The (a) and (b) chains, within the context of the entire passage, create a "feel" for the "freaking crazed truck." Together with the (c) chain, the (a) and (b) chains also help determine the feel for San Francisco and the environment of the martini glass symbol for bar. None of this feel is factual and therefore easily articulated in a retelling. Rather, this feel represents an affective factor in the reader's comprehension of a text.

Structural analyses of text dispense with any consideration of cohesion and its effect on recall. Comprehension scores based on recall of the story outline do not incorporate the felt quality of a reader's comprehension of a story. Analyzing the cohesive element in an evaluation of a text could lead to new insights into the text's or author's influence upon the reader's comprehension and appreciation of text. However, from the researcher's point of view, it is questionable to what extent the influence of cohesive relations

can be systematically studied. Halliday and Hasan's examples of cohesion in text are only descriptive. That is, while they assess the character of cohesion's presence, they do not offer standards for interpreting and analyzing cohesive patterns.

If the researcher cannot be sure of the nature of cohesion patterns across text or the influence of cohesive patterns upon comprehension, the teacher can only use cohesion indirectly. For example, prior to the use of a text, teachers might examine its cohesive patterns. This might include an examination of possible anaphoric ambiguities, macrorelations across sentences and cohesive chains. Beyond these rudimentary suggestions, the ramifications of cohesive analyses for the classroom teacher have yet to be explored.

Story Grammars

A story grammar exists as an approximation of a reader's internalized grammar for a single protagonist narrative (Mandler & Johnson, 1977; Rumelhart, 1975; Stein & Glenn, 1978; Thorndyke, 1977). This internalized story structure involves invariant categories which foster reader instantiations. Generally, these categories are hierarchical and include the equivalents of setting, event structure, episodes, initiating event for the episode, a reaction to the initiating event, internal and external response components to the reaction, attempt and consequent components and a final resolution. Consider the following story:

1. Dick lived on a farm in Vermont.
2. One night he heard a fox in the chicken coop.
3. He knew he had to kill it.
4. Dick got his rifle
5. and went to the chicken coop.
6. He surprised the fox with a chicken in its mouth.
7. Dick shot the fox where it stood.
8. Dick buried the fox.

This story could map onto a tree diagram as depicted in Figure 2a. In some stories, subcategories of Character, Time and Location may be subordinate to

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Insert Figure 2a about here.

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the Setting. Multiple episodes could occur under the Event Structure if the story demanded it. Episodes could also be embedded within other categories of the story structure (an Initiating Event might be an episode in it own right). In order to allow a story grammar to generate stories of varying complexity, structural nodes in the grammar must allow for such embedding to take place. For example, in the grammar constructed by Mandler and Johnson (1977), the Ending category, corresponding to the Resolution category in Figure 2a, has three subordinate nodes. They are [Event*(AND Emphasis)/ Emphasis/Episode]. The brackets indicate that one and only one of the three enclosed sub-categories is possible. The asterisk indicates that there can be no more than one event. The parentheses indicate an optional complement to Event*. The slash lines separate the three choices. In turn, each of the three subcategories has its own subordinate nodes. The evident hierarchical complexity allows for the generation of stories with complex event structures.

Of all the story grammarians, Mandler and Johnson (1977) provide a grammar that can accommodate more complex stories. They make their grammar manageable by isolating the relational terms that connect individual nodes. These terms are AND, THEN, and CAUSE. The AND term indicates simultaneity. THEN indicates a temporal or sequential relationship. And CAUSE connects two nodes, the first of which provides the reason for the second to happen. The relational terms are abbreviated A, T, C and are inserted between nodes in the tree diagram. The tree diagram in Figure 2b has incorporated these labels.

Insert Figure 2b about here.

The use of such relational terms in the grammar is an improvement over other grammars which omit them. It is not that the A, T, C terms introduce new information; rather, the terms make the grammar and its representation more readable and specify the relationship between inferred and stated propositions. In the above story, Proposition 3 might have been omitted, in which case the internal response is inferred and is assumed to be the cause of Dick's getting the rifle.

Rumelhart (1975) further discriminates between uses of relational terms. He suggests semantic interpretation rules intended to allow the reader to decode the syntactic rules of the grammar. His semantic interpretation rules include the relational concepts ALLOW, AND, INITIATE, CAUSE, MOTIVATE, and THEN. For example, applying these rules, the tree diagram depicted in Figure 2a could be read as 1 ALLOWS the story to proceed. 2 INITIATES Dick's reaction to the situation. 3 MOTIVATES Dick to act. He does 4 and THEN 5 which together ALLOW him to be in the situation 6 which ALLOWS 7.

The theoretical notion of an internalized story grammar has received support from cognitive psychology (Kintsch, 1977a, 1977b; Kintsch & van Dijk, 1978; van Dijk, 1977). Basically, it is assumed that individuals cannot mentally comprehend whole texts without a "deep," internalized plan. In this regard, the relative simplicity of story grammars makes them efficient tools for research on the effects of narrative structure on comprehension. However, in their emphasis on invariant structural categories in text, story grammars may be unsuitable for studying the effects of either variant story structures or stylistic elements. Across less contrived narratives, the latter can have a pervasive influence upon a reader's understanding.

To the practitioner it would seem that story grammars offer a manageable procedure by which qualitative assessments of both story and story comprehension can be made. Yet there seem to be arguments for and against such uses. Certainly, story grammars might be used to examine the quality of the form of selected stories within published materials. But it could be argued that story grammars represent a restricted range of stories and their use as a teaching or testing device would be difficult to justify. It might be argued, for example, that existing story grammars fail to address alternate purposes for reading and writing, confine their consideration of story features to a single protagonist narrative and represent an internalized structure that need not be taught. For example, used as a grid against which a subject's recall is matched, story grammars would appear to give an equal weight to all parts of a story. Maybe to the reader what might be

considered a structurally unimportant proposition reflects the major theme of a story. The point is that rigid assessments based upon story grammars do not seem legitimate or consistent with their intended use. They afford no affective component, no pragmatics which would make the reader equally as important as the text.

Event Chain Formulation for Narratives

An event chain formulation for narratives is not patterned after an internalized story structure or a single-protagonist episodic structure (Trabasso & Nicholas, in press; Warren, Nicholas & Trabasso, in press). In its representation, an event chain depicts, for each protagonist, several broad classes of events (states, events, actions, cognitions, displays, impulses, and goals) and logical connectives (motivation, physical cause, psychological cause, enablement, temporal succession, and temporal coexistence). Certain a priori rules constrain the possible combination of event types and connectives. For example, only certain classes of events (action, display and event) can have a causal relationship which is physical. In stories involving multiple protagonists, the events related to each protagonist shift horizontally in accordance with a shift in characters.

As an illustration of the structure of an event chain, consider the following brief story and its depiction in Figure 3.

Insert Figure 3 about here.

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1. It was the weekend.
2. Martyn was playing in the sand tray.
3. Karyn felt mischievous.
4. She decided to tease Martyn.
5. When Martyn was not looking,
6. she turned the hose on.
7. Martyn was covered with water.
8. He grabbed the hose.
9. He was very angry.
10. So to get even with Karyn,
11. he sprayed her.

The figure depicts the event chain of the story with each event numbered and labelled. Their interconnections are represented by a labelled arrow; the shift in protagonist is depicted by a shift in horizontal lines from Karyn and Martyn.

In conjunction with their formulation of event chains, Warren, Nicholas and Trabasso (in press) and Trabasso and Nicholas (in press) propose a taxonomy of inferences. Their taxonomy provides categories for the types of inferences a reader might make within and across event chains. The categories of inference within the taxonomy include three broad types: logical, informational, and value inferences. The informational inferences involve the determination of the "who," "what," "when," and "where" within stories. The logical inference category addresses the "how" and "why" of stories. Value inferences address the "so what" of the story. Table 4 provides additional detail regarding the sub-classes and functions of each category.

Insert Table 4 about here.

In an attempt to define practical limits to inferencing, the authors address what they term a "relevancy hypothesis." The relevancy hypothesis states that the reader, understanding a narrative, should make only those inferences determined by and integral to the progress of the narrative. In other words, the reader should make only those inferences necessary to determine what happened and why. While certain inferences may be consistent with the text and add color to the story, they are irrelevant to the flow of the narrative.

As with story grammars, an event chain formulation is a manageable procedure which can afford valuable qualitative data on text, readers and discourse processes. But there are several advantages which an event chain formulation has when compared with a story grammar: (a) an event chain analysis is not restricted to a single protagonist situation; (b) an event chain formulation does not ascribe a singular framework or model to all narratives; (c) a portion, rather than the whole, of a text can be subjected to this type of analysis; and (d) assuming the adequacy of the taxonomy of inferences and the legitimacy of the relevancy hypothesis, discourse processes can be categorized and evaluated. On the negative side, an event chain formulation fails to address the influence of variant reader purposes and affords a structural analysis of only the events within a story. With regard to reader purposes, the relevancy hypothesis erroneously assumes common purposes across different texts, readers and reading situations.

in terms of the scope of an event chain formulation, unfortunately, larger structural units such as setting and resolution are not addressed.

From the viewpoint of a practitioner, an event chain formulation might be useful for purposes of examining the flow of a narrative and deriving testing and teaching paradigms. For example, given the difficulty some readers often have in disambiguating narrative involving multiple protagonists, it may prove beneficial to have readers map the chain of events within the episodic structure of complex narratives.

Expository Prose Predicate Structures

In The Organization of Prose and Its Effects on Memory, Meyer (1975a) provides an expository analog to story grammars. Specifically, Meyer provides a structural analysis of prose based upon the relationships in the content of a passage. As Meyer states, her analysis

> . . . . depicts the relationships among the content of the passage. It shows how an author of a passage has organized his ideas to convey his message, the primary purpose of his writing endeavor. (p. 3)

Whereas the story grammarians assume a culturally internalized story grammar for narrative text, Meyer suggests that in expository text there is not an expository grammar that individuals in a culture share. Rather, there is only the superstructure created by the author.

Meyer's structural analysis of prose is based on relationships which she defines as predicates. There are two types of predicates, lexical and rhetorical. Generally, a lexical predicate dominates the arguments of a sentence. The arguments of the sentence are connected by role relations

which are always subordinate to the dominant lexical predicate. Consider the first example in Figure 4a. In the tree diagram, the lexical predicate

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Insert Figure 4a about here.

BLEW dominates the structure of the sentence. Each of the three brackets defines the role of an argument and the argument. WIND is the force that acts on the patient, WEATHERVANE, in a specific range or area of action, the ROOF. The lexical predicate and its arguments define a lexical proposition. Based on the work of Fillmore (1968) and Grimes (1972), Meyer details nine types of role relationships.

Rhetorical predicates relate ideas that typically extend across sentence boundaries. More importantly, they are the means by which an author organizes the whole text. The rhetorical predicates of a text define its general organization. Based upon Grimes (1972), Meyer describes three types of rhetorical predicates: paratactic, hypotactic, and neutral. A rhetorical predicate is paratactic if the main arguments of a text all receive equal time. Hypotactic rhetorical predicates describe texts whose arguments are organized hierarchically. Neutral rhetorical predicates are ones that can be paratactic or hypotactic depending on the author's purpose.

As stated above, rhetorical predicates represent the principle by which any piece of expository prose is organized. Rhetorical predicates can also dominate a paragraph and, in turn, be dominated by the rhetorical predicate of a chapter which is, in turn, dominated by another rhetorical predicate which dominates the whole text. In other words, there is in a text of any length

a hierarchical organization of ideas defined by the organizational principles carried in the rhetorical predicates.

Figure 4b is an example of a response rhetorical predicate, a type of paratactic rhetorical predicate. It represents the organizational structure of an article on alternative schools. The vertical line indicates

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Insert Figure 4b about here.

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the paratactic or equivalent status of the arguments. Underlined words with lower case letters indicate rhetorical predicates or components of a rhetorical predicate. Thus, response is the label of the rhetorical predicate which dominates the entire article. The first component of a reponse predicate is the problem. The item which defines the problem of the response predicate is given next and is written with capital letters. The solution predicate is the complement component to the problem. Its argument follows, also in capital letters.

From her work on rhetorical predicates, Meyer concludes that top-level structural nodes such as problem and solution are stored in memeory preferentially and are most easily accessed in recall tasks. Thus, in the above example, the relationship of truancy and alternative schools has priority in memory storage--not necessarily as individual facts but as principles to which the rest of the information in the article is made subordinate. Meyer concludes that information organized at hierarchically inferior levels is less easily remembered, if not deleted from the individual's organization of the information in memory.

What follows is a text and a structural representation of a portion of the content of the text. The representation is done according to Meyer's guidelines for depicting content structure. Left-most entries are hierarchically dominant to right-most entries. Small case, underlined words identify rhetorical propositions. Capitalized words with dotted underlining are lexical predicates from the text. Words in small case but not underlined identify the role of an argument in a lexical proposition. Non-underlined capitalized words are words taken from the text. Rhetorical predicates and role relations in the diagram are somewhat self-explanatory. Also self-explanatory is the left to right display of dominant-subordinate information.

The content structure of a text may be broken down to whatever level desired. For example, an entry such as 14 in Figure 5 could be broken down in terms of its lexical predicate. In Meyer's work, texts are broken down to the point where significant items for recall are identified in isolation in the content structure. Retellings are scored according to the extent to which they reflect the dominant rhetorical structure of the text and articulate subordinate propositions and relationships:

> Cracking the Cycles of Depression and Mania[1] by Joel Greenberg
> SOME PERSONS WITH AFFECTIVE DISORDERS APPEAR TO BE OUT OF PHASE WITH THE NORMAL 24-HOUR DAY. CHANGING THEIR SLEEP-WAKE CYLES CAN TRIGGER DRAMATIC IMPROVEMENTS.

Despite significant advances in understanding and treating depression and manic-depression, these "affective" disorders still carry with them some of the more curious mysteries in behavioral science. The puzzle involves an apparent cyclic or "up and down" characteristic in certain patients. Many depressives, for example, suffer most in the morning (sleep disturbance is thought to be central to depression); others show some bizarre hormonal activity that appears to be out of synch with normal metabolism; and still others--particulary manic-depressives--seem to function on a daily and annual calendar of their own.

Perhaps shedding some light on affective illness are newly reported research results from the National Institute of Mental Health's Clinical Psychobiology Branch in Bethesda, Maryland. The findings indicate that slightly abnormal biological rhythms--both long and short term--may be key factors in the development of depression and manic depression.

It was found that melatonin--an indicator of brain norepinephrine activity--seems to run through a cycle in which it peaks in January and July and hits valleys in May and October, while platelet serotonin appears to be on a reverse cycle, with its activity reaching peaks in May and October. Both norepinephrine and serotonin have been implicated in depression.

"We've known for a long time that there are annual rhythms and seasonal variations in a lot of illness," says NIMH Clinical Psychobiology Chief Frederick K. Goodwin, who conducted much of the research. "Affective illness is [frequently] a recurrent phenomenon." and the research results suggest "the possibility of some long-term cyclic process."

In the other portion of the work, Goodwin and his colleagues observed that the daily biological rhythms of some persons with affective disorders are slightly out of phase with the standard 24-hour day. In bipolor, or manic-depressive patients, the

researchers had not noticed that several days before the periodic manic phase set in, the patients would go to bed and wake up somewhat earlier than usual. If such a sleep-wake change was associated with the shift away from depression, the investigators reasoned, perhaps intentionally manipulating the pattern would help depressives--which it did.

Insert Figure 5 about here.

Meyer claims that her structural analysis procedures provide the researcher with the basis for describing prose passages, examining reading comprehension and studying the effects of structural manipulation of prose upon comprehension. Meyer states that, given a system for describing the organizational structure of prose passages, research now has a means of describing and comparing prose structures. Also, given the structural dimension, recall tasks can be effectively scored and compared. Meyer claims that content structure can now be used to study such topics as individual differences in reading comprehension, the influence of prior knowledge on reading tasks, and the effect of variant positioning of top-level structural variables within the text.

Likewise, Meyer claims that these structural analysis procedures have afforded results and a technology which might have relevance to educators, writers and publishers. She suggests that writers should place information they want readers to remember high in the content structure of their prose. She suggests that a tightly structured text is more readily comprehended than a loosely structured text. She urges teachers and students to diagram

text structures in an effort to discern the importance of ideas. In all, she sees structural analysis of text in terms of the following:

> . . . providing data for a theory of learning from prose, information about individual differences in learning, a potential diagnostic tool for educators to identify areas of learning problems, and a model for writers of text questions, texts, and other prose materials. (Meyer, 1977, p. 199)

Critics of Meyer would argue that she makes the tool the subject matter. That is, Meyer fails to consider the differential and interactive contributions reader and context will and should play in discourse comprehension.

For the theorist, Meyer's work raises some interesting questions. The story grammarians acknowledge the presence and power of generic structure for stories in the mind of the reader. Meyer does not necessarily believe there are no generic structures for which the rhetorical predicates she describes are approximations. Obviously, familiarity with a particular paratactic organizational structure in a text will help a reader encode information organized according to the principle of that structure. Obviously, the reader comes to the reading task with some prior knowledge that can help comprehend the information at hand. However, in accordance with her intent--to scientifically study the effect of prose structure on memory--Meyer makes no claims to be representing approximations to what might be called a generic system of structural principles for organizing prose texts.

Mapped Patterns

An alternative to Meyer's structural analysis procedures is a technique called mapping. Mapping involves defining the organizational pattern of ideas within text. To this end, a map of a text is developed which reflects the pattern of relations within a text.

Based upon the work of Hanf (1971) and Merritt, Prior and Grugeon (1977), a team of researchers at the Center for the Study of Reading have developed a mapping technique to serve as a procedure for diagramming idealized representations of texts (Anderson, 1978). The mapping technique incorporates the visual-spatial conventions for diagramming ideas and the nature of relationships between ideas. The scheme includes seven fundamental relationships between ideas: concept and example, concept and properties, concept and definition, temporal succession, cause and effect, conditional and comparison. (These relationships and their mapping scheme are depicted in Figure 6). The relationship between concept and its characteristics is depicted as a segmented box similar to a lined outline. The notation for a relationship between a concept and examples is similar to a Venn diagram. The compare and contrast notation is similar to a double entry table; the causal and temporal notation is similar to flowcharting.

Insert Figure 6 about here.

An important quality of the map of a text, as illustrated in Figure 7, is that the shape of the map is supposed to represent an idealized organizational pattern of the ideas. For example, when a map based upon a text

is characterized by a series of boxes connected by arrows, then the text is concerned with either a set of procedures, a sequence of events, or causality. The map of the text given in Figure 7 exemplifies the latter two types.

Insert Figure 7 about here.

As a text analysis tool, mapping offers some unique possibilities over other techniques. In its simplicity it affords researchers, writers, teachers and students an accessible procedure by which the characteristics of discourse can be examined and against which a reader's comprehension can be compared. The overall shape of a map affords an appreciation of the "totality" of a text. The notational details and the task of formulating the map afford an appreciation of both the complexity and explicitness with which ideas and relationships exist within a text.

As an instructional procedure, it has certain advantages over outlining in that it offers an examination of the relationships between ideas. As with other procedures, however, one must wonder whether or not mapping may encourage text-bound interpretations. As Tierney and Spiro (1979) argue:

> Instructional techniques that sponsor rigid procedures on students . . . may interfere with approaches a reader might more naturally and effectively bring to bear given the exigencies of text, task and reader knowledge. (p. 136)

Indeed, Anderson (Note 5) has suggested that the worth of mapping seems to vary across the reader's intended purposes, the nature of the mapping activity and the demands of the text itself. As Anderson explained, students may profit from mapping the important ideas and those sections of text that

are confusing; however, they should in no way be expected to map extended chunks of text (e.g., chapters).

Applications of Text Analysis

Although the results of text analysis seem encouraging, it would be amiss to suggest that text analysis is not without limitations. Certainly, text analysis provides a means for systematic examinations of characteristics of text and their differential influence upon comprehension. Already, numerous studies have provided invaluable insights through the use of a text analysis procedural model. But the findings apply to a restricted range of text types, text features, and reading situations. Text analysis does not afford an analysis of every text characteristic, across every text, across every reading situation.

Researchers intent on text analysis must remain cognizant of what is being measured, the context within which things are being measured, the reliability with which features can be discerned, and those aspects of text eluding analyses. Consistent with our first major thesis, researchers should examine text features within an interactive framework. That is, researchers should remain alert to the influence of those variables which interact with text features. Furthermore, researchers intent on text analysis should closely examine the purpose of their research pursuit. A researcher may wish to subject a passage or passages to a variety of analyses which have the potential to afford valuable insights. For certain purposes, a researcher may find that text analysis is not an appropriate

tool; alternatively, a researcher may find a variety of text analyses to be appropriate.

While text analysis procedural models have and will have research applications, less obvious is whether text analysis will serve the classroom teacher and associated reading personnel. Already, we have argued that it would be amiss to use text analysis models, at least in their present forms, to derive reading comprehension performance scores. Also, we have suggested that instructional paradigms based upon text analysis models could stifle reader-text interactions. Although certain text features appear to have a differential influence upon reading comprehension, we are unaware of any research to confirm that teachers or curriculum materials should either highlight, emphasize or teach these features. Indeed, it should be noted that text analysis procedures were never intended to serve as curriculum guides, and very few of the authors sampled in the previous section have ever advocated such uses.

Despite these limitations, some pedagogical applications of text analysis seem intuitively appealing. For example, it does seem reasonable to suggest that text analysis procedures might be used for the following purposes:

(1) To examine and appreciate the differential responses of readers to text features. A text analysis procedural model may offer a teacher a framework for examining and systematically unravelling the relationship between the information gleaned by readers and the presentation of information in the text. For example, by comparing readers' recall with an

appropriate analysis of the original text, questions similar to the following can be pursued: What influence did the readers' background knowledge have upon their interpretation? How was their knowledge altered and what new information did they learn? How many and what types of inferences did the readers make? What information did readers restructure, disambiguate, abstract? Indeed, a simplified form of text analysis can be used to match the reader's recall against an analysis of the text. Readers can match their ideas against the explicit ideas in the text, or against a map of the text or a structural representation of these ideas. In so doing, readers could discuss the nature, basis and legitimacy of their deletions, insertions and substitutions; teachers could probe the extent to which a reader's interpretation was plausible and consistent with desired learning outcomes.

(2) To examine and appreciate the text demands placed upon readers. Knowledge of the characteristics of text can afford teachers an appreciation of the demands a text places upon a reader. For example, an examination of text characteristics, via text analysis, may afford answers to the following: What information does the text contain explicitly? What information will readers likely infer? How is the text organized? What text characteristics are likely to detract from or contribute to idiosyncratic reader interpretations? By undertaking even simplified adaptations of text analysis, teachers can be acquainted with the explicit information within a text, the organization of ideas across a text and information authors assume their readers will bring to the text. If a teacher were planning to use a text selection for the purpose of addressing causes of certain events, a simplified

text analysis might be used to examine incidences of causal, temporal or conditional chains within the text. If a teacher were planning to use a text to introduce a new concept, analysis might be used to examine the extent to which new learnings are tied to explicit text-based information or familiar reader-based concepts. If a teacher were planning to question readers on a text, a simplified structural representation of a text might afford an appreciation of the ideas keyed within the text.

(3) To examine and appreciate the relevance and plausibility of a reader's text-based inferences. By focussing on certain questions (e.g., What information do readers incorporate into their knowledge structures? What sorts of derived information do readers acquire?), text analysis can afford a systematic examination of the plausibility and relevance of reader-generated knowledge. That is, the extent to which a reader's idiosyncratic response is reasonable can be discerned more readily. To this end, our discussion of text analysis systems offers a variety of procedures which could be adopted and adapted for these purposes. Specifically, event chain formulations and Frederiksen's semantic and logical networks could provide curriculum developers and teachers a detailed listing of inference types. Toward qualitative and subjective evaluations of inferencing, the relevancy hypothesis proposed by Trabasso and Nichols and the selected subcategories proposed for Frederiksen's taxonomy of inferences could be applied to assess the reasonableness of idiosyncratic responses by readers.

(4) To afford teachers and readers a metacognitive awareness of text demands. Brown (in press) has stated that some readers seem uninformed about the task of reading and might profit from knowing more regarding the nature of discourse demands. That is, readers might profit from metacognitive explanations of the relationships which exist between text characteristics and their interpretations. For example, teachers and their students could explore through discussion the extent to which their various idiosyncratic interpretations match the explicit/implicit text features. Through the use of mapping, event-chain formulation, story grammars, or even cohesive analysis, teachers and students might study the impact of how ideas are patterned differently across texts.

(5) To suggest instructional and testing procedures consistent with text demands. Given that texts are used as a primary means for instruction in most school settings and given that text-based tests are used as a primary means of assessment, the demands imposed on a reader by text-based teaching and text-based testing should be examined. By comparing the characteristics of texts against teacher expectations, a simplified form of text analysis can afford at least some minimal appreciation of the nature of the demands imposed upon readers. Toward the improvement of both tests, texts, and instructional support, then, some form of text analysis might guide the teacher in the selection, perusal and development of tasks. This might entail examining the extent to which answers to questions are supported by text-based information. It might require some reflection on the extent to which the apparent purposes of an author for his text coincide with its

instructional uses. The point is that the ideas represented in a text should be examined prior to assuming their saliency. Without these types of examinations, texts are apt to be used by publishers, test-developers and teachers for purposes other than those for which they are either capable of serving or intended to serve.

Concluding Remarks

To reiterate, the purpose of this paper was to introduce readers to text analyses as a research tool and as a vehicle for examining instruction. The uses of text analysis have been sampled--not exhausted. In terms of perspective, it has been our thesis that text analysis has the potential to be used and misused. Within the context of an appreciation of reader-text interactions, analysis of text features seem both warranted and appealing. Outside this context, an overemphasis upon such analyses or their derivatives may be misguided. Hopefully, this paper will prompt appropriate uses of these models. Finally, the reader should be reminded that this paper is not intended as the primary source for any single text analysis model proposed herein.

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Footnote

[1]Adapted from an article of the same title in Science News, Vol. 114, No. 22, November 25, 1978, p. 367.

Table 1

Frederiksen Semantic and Logical Networks

His shirt was jumping back and forth.
His mother came running.

Recall:

The shirt was jumping back and forth on the bed. Then Johnny's mother came running.

Message Base (Knowledge Structure) of Text

01 ('Johnny) - PAT @ TEM (PRES) - (has) - OBJ - (:shirt)
(shirt) - DEF - NUM - (one)

02 ("01) - AGT @ TEM (PAST) ASPECT (CONT) - (jump) - MAN - (back and forth)

03 ('Johnny) - PAT @ TEM (PAST) - (has) - DAT - (:mother)

04 ("03) - AGT @ TEM (PAST) - (came) - MAN - (running)

Key to Symbols in Network

( )	concept
(:)	concept to be determined and quantified
(')	concept not to be determined and quantified
(")	reference to proposition usually cited by number
@	marks an operation on the relation

Relations

Case relations, resultive propositions

AGT	Agent	participant in the act
DAT	Dative	recipient of the act (animate)
OBJ	Object	recipient of the act (inanimate)

Case relations, processive propositions

PAT	Patient	participant in the act
DAT	Dative	recipient of the act (animate)
OBJ	Object	recipient of the act (inanimate)

Other

MAN	Manner	adverbial
DEF	Determination	(definite)
TOK	Determination	(indefinite)
NUM	Quantification	
PAST	one of a variety of tenses	
CONT	one of a variety of aspects	

Table 2

Modified Frederiksen Taxonomy of Text-Based Inferences

Identification Operation*

1. Attribute inference
2. Category inference
3. Time inference
4. Locative inference
5. Part-whole inference
6. Degree inference
7. Manner inference
8. Identity inference

Frame Operations*

9. Act inference
10. Case inference
11. Instrument inference
12. Result inference
13. Source inference
14. Goal inference
15. Theme inference
16. Frame transformation
17. Qualifier inference
18. Disembedding

Event Generation**

19. Event generation (synonomous)

Algebraic Operations**

20. Algebraic inference

Dependency Operations**

21. Causal inference
22. Conditional inference
23. Contrastive inference
24. Concessional inference
25. Conjuncture inference
26. Disjunctive inference

* Refers to:

a. synonymous slot substitute
b. superordinate slot substitute
c. subordinate slot substitute
d. semantically different slot substitute
e. generation of relation and concept

** Refers to:

a. plausible and relevant
b. implausible and irrelevant
c. irrelevant, plausible

Table 3

Frederiksen's Functional Contexts of Inferences in Reading Comprehension

Types	Function
First stage inference -resolution of ambiguity -resolution of cataphora -Dietic inference: person, place, time	Interpretation of a current sentence by replacing anaphoric elements in proposition, with referrents and resolving ambiguities by selecting a preferred reading
Connective inferences	Connecting disconnected propositions
Extensive inference	Generating new propositions which extend meaning given by original set
Structural inference -segmentation -topical inference -reduction	Segmenting and organizing a text, building a coherent model of a text as a whole

Note: Based upon Frederiksen (Note 2) and Frederiksen et al. (Note 3).

Table 4

Taxonomy of Inferences Based Upon Event-Chain Formulation

Classes	Functions
1. Logical Inference	
a. Motivation	Inferring causes for a character's given voluntary thoughts, actions or goals (or vice versa) e.g., John was angry. He left.
b. psychological cause	Inferring causes for a character's given voluntary thoughts, actions or feelings (or vice versa) e.g., John tripped on the stone. He shouted.
c. physical cause	Inferring mechanical causes for given objective events or states (or vice versa) e.g., Lightening hit. The tree fell. David smashed the car. His passenger was injured.
d. enablement	Determining the conditions necessary but not sufficient for a given event to occur. Determine the event a certain condition allows, e.g., It was windy. They could fly the kite.
2. Information Inference	
a. pronominal	Specify the antecedents or pronouns, e.g., Chuck was late. He was mad.
b. referential	Specify the related antecedents of given actions or events when the reference is not pronominally marked, whether or not they are explicitly stated in other propositions, e.g., Carol found her father's car in front of the school. She ran and hopped in.

Table 4 Cont'd

	Classes	Functions
	c. spatio-temporal	Determine the place or time of a single or series of propositions, e.g., It was Friday afternoon. They ran to the football park. The children were all ready.
	d. world-frame	Determining a world context to account for inferences, e.g., They saw the lions, tigers, seals, and monkeys.
	e. elaborate	Flushing out additions which do not contribute to the logical process of the story.
3.	Value Inferences	Juding the morality, convention, and anomaly in character's thoughts and actions or in story style or construction, e.g., John wanted to tease Peter. He asked him if he could leave the party. Peter was shocked and angrily shouted obscenities. Was shouting obscenities a good way to deal with John?

Note: Based upon Warren, Nicholas and Trabasso (in press).

Figure Captions

Figure 1. The nature of author, text, and reader relationships during discourse production and comprehension.

Figure 2a. Story grammar analyses.

Figure 2b. Story grammar analyses (continued).

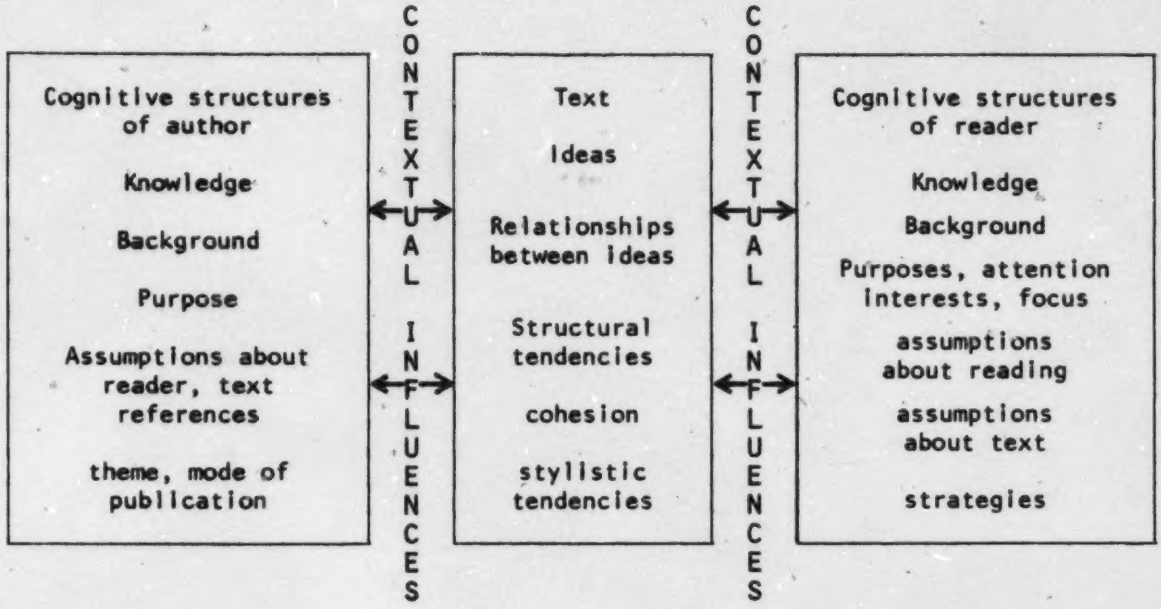
Figure 3. Event chain for the narrative involving Karyn and Martyn.

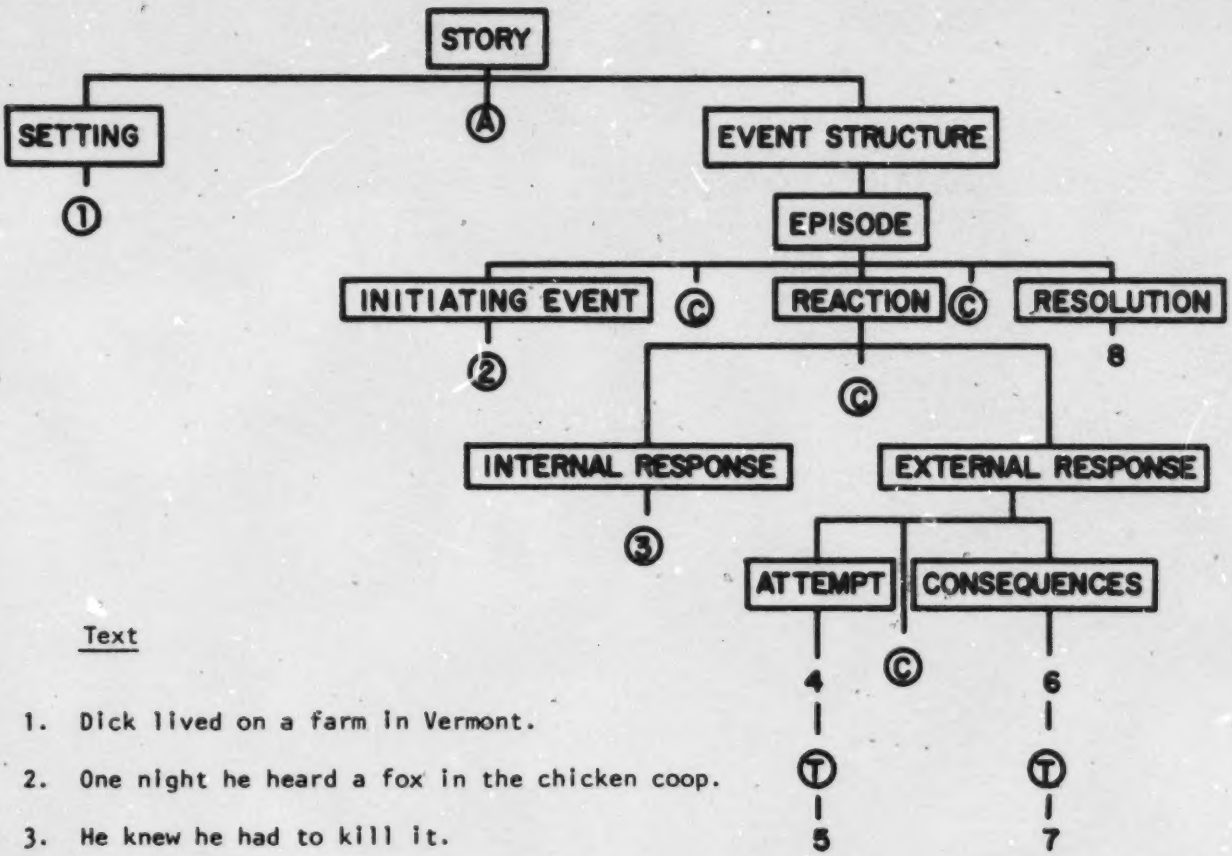
Figure 4. Meyer structural analysis of prose (the predicates).

Figure 5. The content structure of "Cracking the Cycles of Depression and Mania" (not all information in the text is diagrammed).

Figure 6. Summary of mapping relationships and symbols.

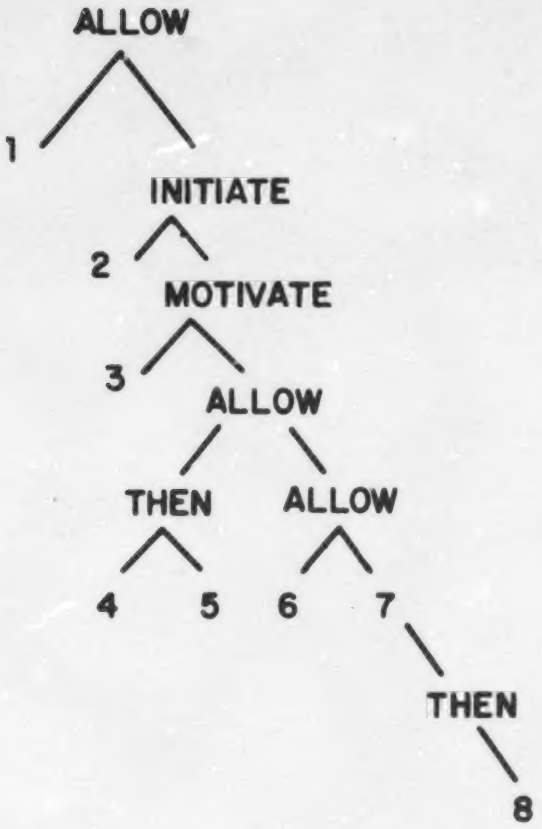
Figure 7. Example of a map of a text.

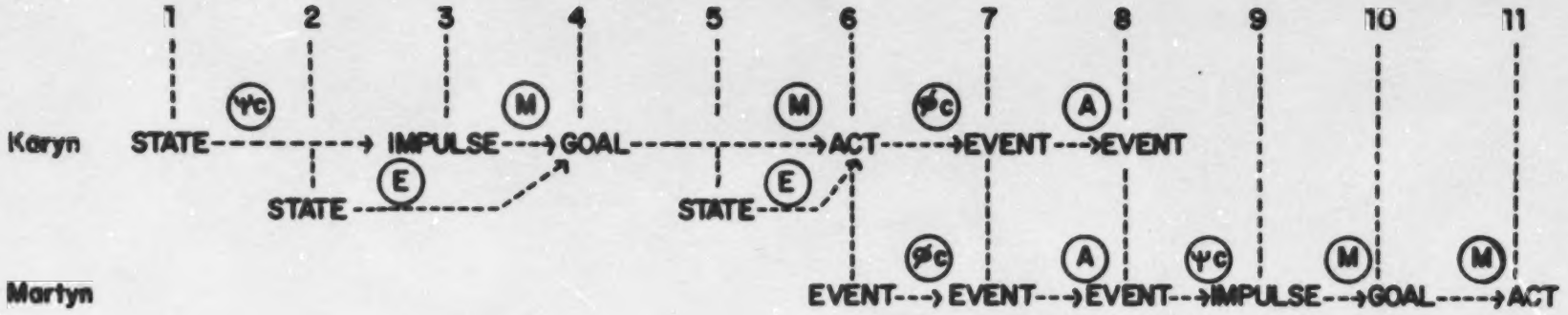

DISCOURSE PRODUCTION
DISCOURSE COMPREHENSION
Cognitive structures of author
Knowledge
Background
Purpose
Assumptions about reader, text references
theme, mode of publication
CONTEXTUAL INFLUENCES
Text
Ideas
Relationships between ideas
Structural tendencies
cohesion
stylistic tendencies
CONTEXTUAL INFLUENCES
Cognitive structures of reader
Knowledge
Background
Purposes, attention interests, focus
assumptions about reading
assumptions about text
strategies



Text

1. Dick lived on a farm in Vermont.
2. One night he heard a fox in the chicken coop.
3. He knew he had to kill it.
4. Dick got his rifle
5. and went to the chicken coop.
6. He suprised the fox with a chicken in its mouth.
7. Dick shot the fox where it stood.
8. Dick buried the fox.


ALLOW
1
INITIATE
2
MOTIVATE
3
ALLOW
THEN
ALLOW
4
5
6
7
THEN
8



Key to symbols

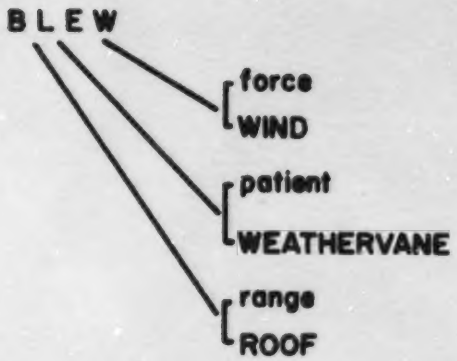
φc - physical cause
M - motivation
ψc - psychological cause
E - enablement
T - temporal succession
A - temporal coexistence

Text

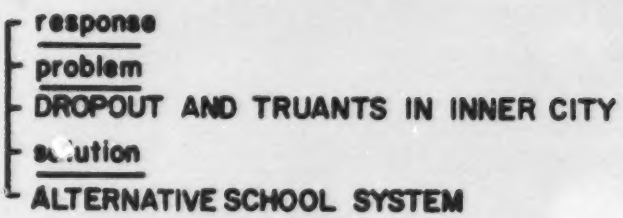
1. It was the weekend.
2. Martyn was playing in the sand tray.
3. Karyn felt mischievous.
4. She decided to tease Martyn.
5. When Martyn was not looking,
6. she turned the hose on.
7. Martyn was covered in water.
8. He grabbed the hose.
9. He was very angry.
10. So to get even with Karyn,
11. he sprayed her.

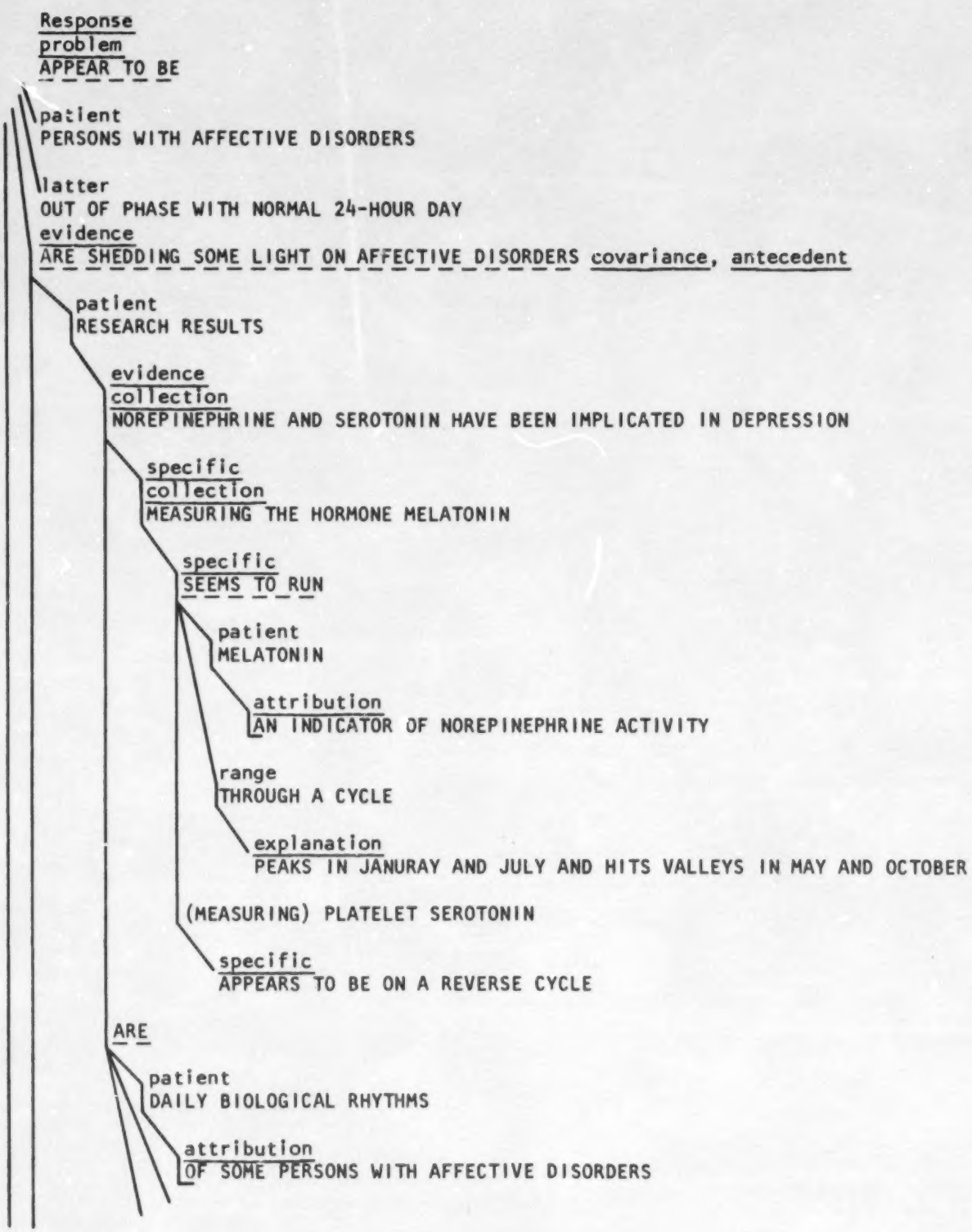
a. **Lexical Predicate**

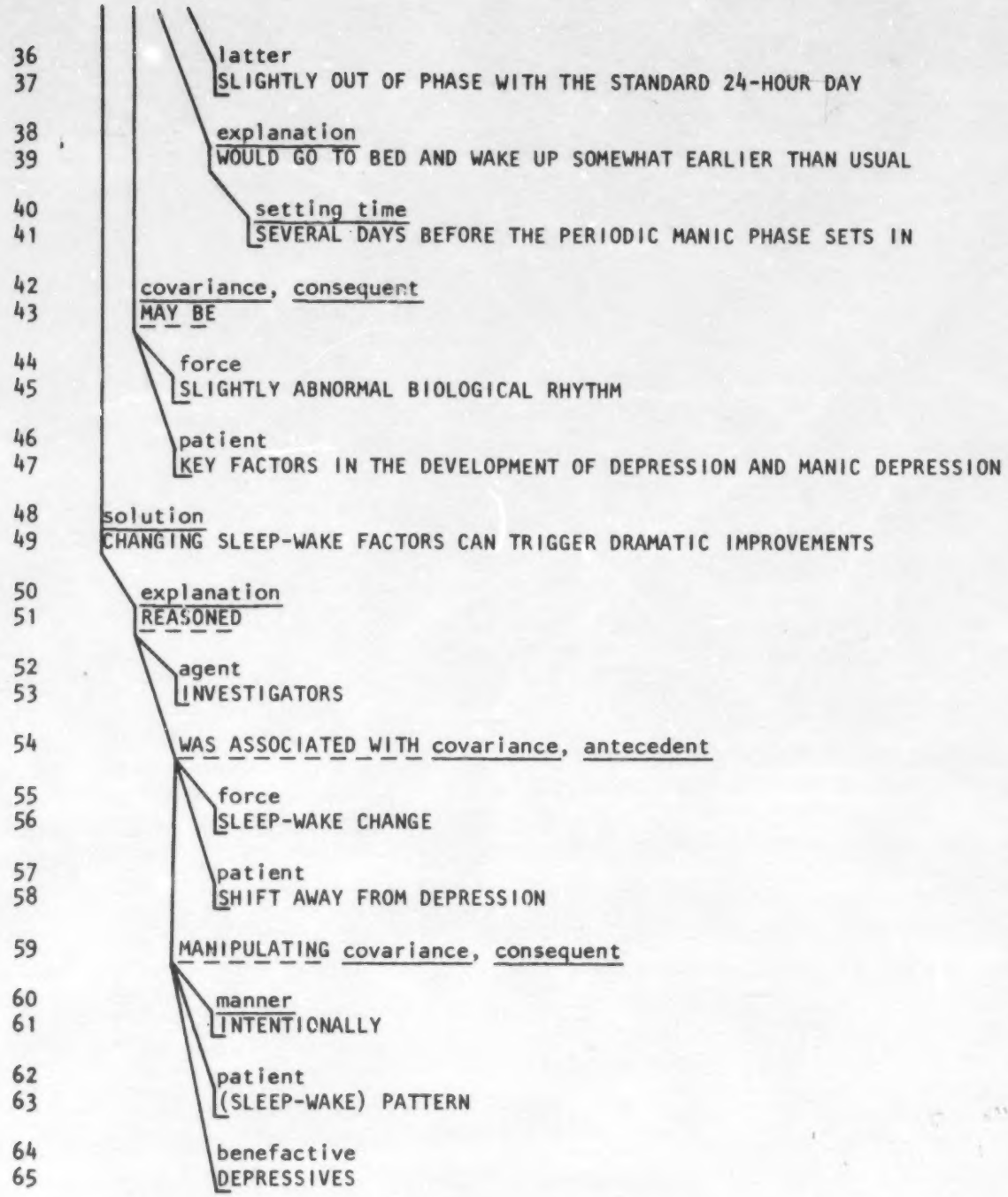
The wind (force) blew (lexical predicate) the weathervane (patient) off the roof (range).



b. **Response Rhetorical Predicate**



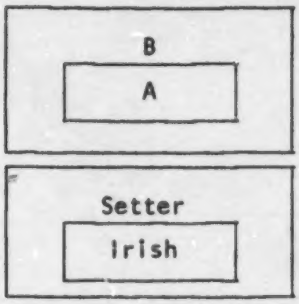

1 Response
2 problem
3 APPEAR TO BE
4 patient
5 PERSONS WITH AFFECTIVE DISORDERS
6 latter
7 OUT OF PHASE WITH NORMAL 24-HOUR DAY
8 evidence
9 ARE SHEDDING SOME LIGHT ON AFFECTIVE DISORDERS covariance, antecedent
10 patient
11 RESEARCH RESULTS
12 evidence
13 collection
14 NOREPINEPHRINE AND SEROTONIN HAVE BEEN IMPLICATED IN DEPRESSION
15 specific
16 collection
17 MEASURING THE HORMONE MELATONIN
18 specific
19 SEEMS TO RUN
20 patient
21 MELATONIN
22 attribution
23 AN INDICATOR OF NOREPINEPHRINE ACTIVITY
24 range
25 THROUGH A CYCLE
26 explanation
27 PEAKS IN JANURAY AND JULY AND HITS VALLEYS IN MAY AND OCTOBER
28 (MEASURING) PLATELET SEROTONIN
29 specific
30 APPEARS TO BE ON A REVERSE CYCLE
31 ARE
32 patient
33 DAILY BIOLOGICAL RHYTHMS
34 attribution
35 OF SOME PERSONS WITH AFFECTIVE DISORDERS


latter
SLIGHTLY OUT OF PHASE WITH THE STANDARD 24-HOUR DAY
explanation
WOULD GO TO BED AND WAKE UP SOMEWHAT EARLIER THAN USUAL
setting time
SEVERAL DAYS BEFORE THE PERIODIC MANIC PHASE SETS IN
covariance, consequent
MAY BE
force
SLIGHTLY ABNORMAL BIOLOGICAL RHYTHM
patient
KEY FACTORS IN THE DEVELOPMENT OF DEPRESSION AND MANIC DEPRESSION
solution
CHANGING SLEEP-WAKE FACTORS CAN TRIGGER DRAMATIC IMPROVEMENTS
explanation
REASONED
agent
INVESTIGATORS
WAS ASSOCIATED WITH covariance, antecedent
force
SLEEP-WAKE CHANGE
patient
SHIFT AWAY FROM DEPRESSION
MANIPULATING covariance, consequent
manner
INTENTIONALLY
patient
(SLEEP-WAKE) PATTERN
benefactive
DEPRESSIVES

1. Concept and Examples

   A is an instance of B

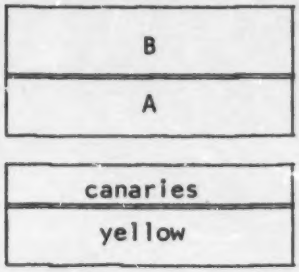
   Example: A common type of setter is the Irish setter.



2. Concept and Properties

   A is a property B

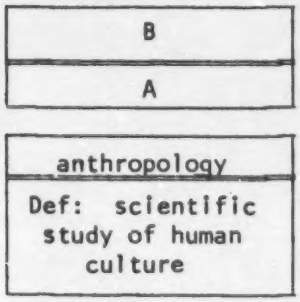
   Example: Canaries are yellow.



3. Concept and Definition

   A defines (restates, clarifies) B

   Example: Anthropology is the scientific study if human culture.



4. Temporal Relationship

   A occurs before B

   Example: Nixon resigned shortly before the Bicentennial celebration.

5. Causal Relationship

   A causes B

   Example: Excessive exposure to the sun causes sunburn.

6. Conditional Relationship

A is a condition of a B is a condition of b

7. Relationship of Comparison

(a) A is similar to B A ≈ B

Example: In most respects, Illinois and Ohio are very similar.

(b) A is not similar to B A ≉ B

Example: The Soviet economic system is quite different from the American system.

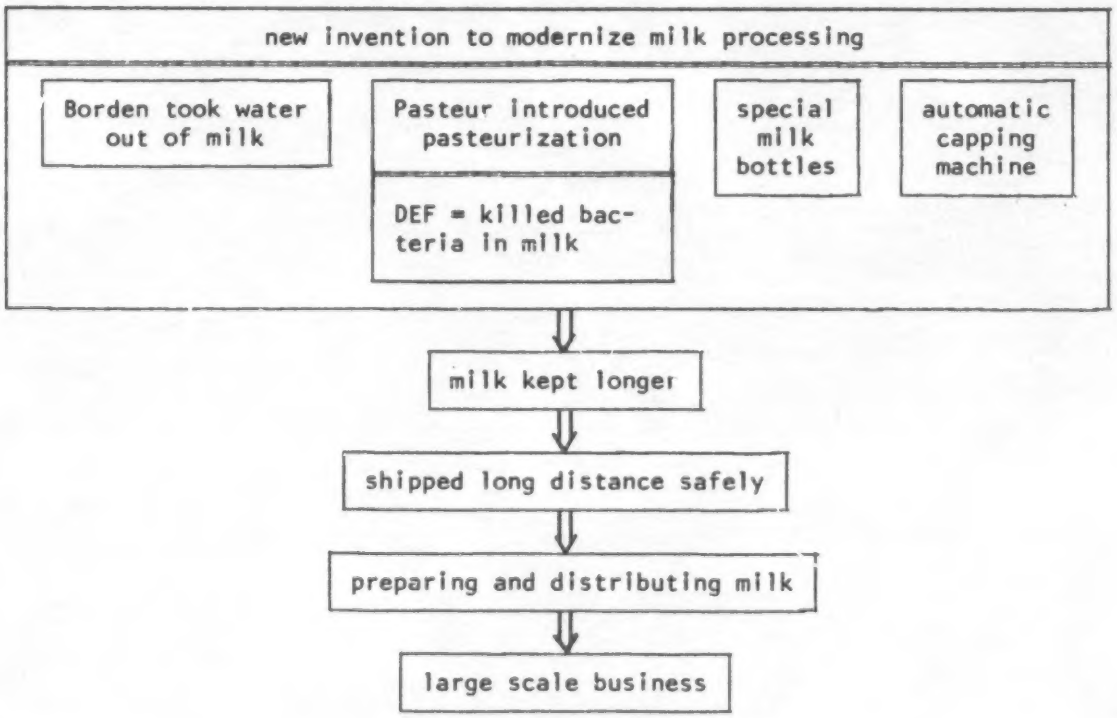
(c) A is greater than B A > B

A is less than B A < B

Example: A liter is slightly more than a quart.

For more than two hundred years most people got their milk from their own cattle or from a nearby dairy herd. But in time, new inventions made the dairy industry a big business. In 1851, Gail Borden, founder of a milk company, found a way to take some of the water out of milk. This made it keep much longer. Four years later, Louis Pasteur introduced the pasteurization process. This process killed the bacteria in milk that caused it to spoil. Next, a special milk bottle was designed. This was followed by the invention of machines that could fill bottles and cap them automatically.

These discoveries had a great effect on the dairy industry. They meant that milk could be stored longer. It could be safei, shipped over long distances. Preparing and distributing milk soon became a large-scale business. Recently, in a single year, more than sixty billion quarts of milk were sold in the United States.


new invention to modernize milk processing
Borden took water out of milk
Pasteur introduced pasteurization
DEF = killed bacteria in milk
special milk bottles
automatic capping machine
milk kept longer
shipped long distance safely
preparing and distributing milk
large scale business

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